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EXAMINER	
THAI, HANH B	
ART UNIT	PAPER NUMBER
2163	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/29/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/008,565	CORBETT, PETER F.	
	Examiner	Art Unit	
	Hanh B. Thai	2163	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *Amendment filed 10/10/06*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22,38,40,41,43,44,46 and 55-81* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22,38,40,41,43,44,46 and 55-81* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The following is a Non-Final Office Action in response to the amendment filed on October 10, 2006. Independent claims 1, 10, 17, 20, 38, 40, 41, 43, 44, 46, 55, 62, 64, 69, 76, 77, 78, 79, 80 and 81 have been amended. Claims 23-37, 39, 42, 45 and 47-54 have been cancelled. Claims 1-22, 38, 40-41, 43-44, 46, 55-79 and 80-81 are pending in this application.

Specification

2. Updated information is required for 'Related Application Section" at page.

Response to Arguments

3. Applicant's arguments regarding "combining a plurality of unbalanced strip arrays to form the balanced array" and "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks" have been fully considered but they are not persuasive.

Stallmo clearly discloses organizing a plurality of disks of varying sizes of parity blocks "the first parity group and the second parity group" into multiple rectangles of disks that all contain the same number of blocks "balanced array" (summary; col.8, lines 45-51 and col.9, lines 15-67, Stallmo). Therefore, Stallmo's teaching of organizing a plurality of disks of varying size of the parity blocks to a form of the same size blocks "balanced array" still reads on the claimed "combining the first parity group and the second parity group to form a balance array."

Baylor discloses double failures in multiple device system that assigned each data block to two different parity sets and these parity block each resided on a different data storage device (abstract, col.3, lines 28-45 and col.4, lines 6-28, Baylor) reads on the claimed "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data

blocks". Therefore, the combination system of Stallmo and Baylor discloses the claimed invention.

Double Patenting

4. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. http://www.ttvn.com.vn/

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-4, 10-11, 17-18, 20-21, 38, 40, 41, 43, 44, 55-56, 62, , 64, 69, 71-73, 76, 77-81 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-2, 12-13, 19-20 and 22 of U.S. Patent No. 6,851,082. Although the conflicting claims are not identical, they are not patentably distinct from each other because these claims are directed toward the same subject matter as claim 1 of the patent '082.

The following table shows the claims in '565 that are rejected by corresponding claims in '082

Claims Comparison Table:

'565	'082

Claims	1-4	1
	10-11	12
	17-18	19
	20-21	22

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-6, 8-12, 14-22, 55-58 and 61-81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stallmo et al. (US 6,052,759) of record in view of Baylor et al. (US Patent no. 5,862,158).

Regarding claim 1, Stallmo discloses a method for enabling parity declustering in a balanced parity array of a storage system, the method comprising the steps of:

- combining a plurality of unbalanced stripe arrays, each unbalance stripe array storing an unequal number of blocks per disk, to form the balanced array, the balanced array storing substantially the same number of blocks on all disks, each unbalanced stripe array having parity blocks on a set of storage devices that are disjoint from a set of storage devices storing data blocks (summary; col.8, lines 45-51 and col.9, lines 15-67, Stallmo discloses organizing a plurality of disks of

varying sizes of parity blocks "a plurality of unbalanced stripe arrays" into multiple rectangles of disks that all contain the same number of blocks "balanced array"); and

- distributing assignment of storage devices to parity groups throughout the balanced array (col.7, line 66 to col.8, line 3).

Stallmo, however, does not disclose parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks. Baylor discloses double failures in multiple device system that assigned each data block to two different parity sets and these parity block each resided on a different data storage device (abstract, col.3, lines 28-45 and col.4, lines 6-28, Baylor) reads on the claimed "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Stallmo to include the claimed limitation as taught by Baylor. The motivation of doing so would have been to enhance the storage device system's availability.

Regarding claim 2, Stallmo/Baylor combination discloses that after a single or double storage device failure, ensuring all surviving data storage devices are loaded and reconstructing storage device failures (col. 2, lines 28-55 and col.4, line 61 to col.5, line 4, Baylor).

Regarding claim 3, Stallmo/Baylor combination discloses wherein the storage system is a filer (col.7, lines 36-42 and col.8, lines 5-9, Stallmo).

Regarding claim 4, Stallmo/Baylor combination discloses dividing each storage device into blocks; and organizing the blocks into stripes across the devices, wherein each stripe contain

data and parity blocks from each of the devices of the balanced array (col.2, lines 28-55 and col.4, line 61 to col.5, line 4, Baylor).

Regarding claim 5, Stallmo/Baylor combination further discloses the step of selecting patterns of characters representing data storage devices of a stripe to thereby change the association of the data storage devices with parity groups from stripe to stripe of the balanced array (see col.3, lines 28-45; col.4, lines 6-28, Baylor).

Regarding claim 6, Stallmo/Baylor combination further discloses that the characters are binary numbers (col. 5, lines 1-3, Baylor).

Regarding claim 8, Stallmo/Baylor combination discloses the steps of configuring the balanced array as a RAID-4 style array; initially under-populating the array with storage devices; and adding storage devices until a fully populated array of predetermined size is achieved (abstract, Fig.1, Fig.4 and col.9, line 47 to col. 10, line 7, Stallmo).

Regarding claim 9, Stallmo/Baylor combination discloses that the storage devices are disks (summary and col.9, lines 14-20, Stallmo).

Regarding claim 10, Stallmo discloses a system that enables parity declustering in a balanced parity array of a storage system, the system comprising:

- a plurality of storage devices, each storage device divided into blocks that are further organized into stripes, wherein each stripe contains data and parity blocks from each of the devices of the balanced array (summary; col.8, lines 45-51 and col. 9, lines 14-20, Stallmo discloses storage disk is divided into "squares" blocks);

- a storage operating system including a storage layer configured to implement a parity assignment technique that distributes assignment of devices to parity groups throughout the balanced array (summary; col.7, line 66 to col.8, line 3 and lines 45-51); and
- a processing element configured to execute the operating system to thereby invoke storage access operations to and from the balanced array in accordance with the concentrated parity technique (summary; col.7, line 66 to col.8, line 3 and lines 45-51).

Stallmo, however, does not disclose parity assignment technique that distributes assignment of devices to parity groups throughout the array. Baylor discloses double failures in multiple device system that assigned each data block to two different parity sets and these parity block each resided on a different data storage device (abstract, col.3, lines 28-45 and col.4, lines 6-28, Baylor) reads on the claimed "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Stallmo to include the claimed limitation as taught by Baylor. The motivation of doing so would have been to enhance the storage device system's availability.

Regarding claim 11, Stallmo discloses the storage layer further combines a plurality of unbalanced stripe arrays to form the balanced array, each unbalanced stripe array having parity blocks on a set of storage devices that are disjoint from a set of storage devices storing data blocks (col.8, lines 45-51 and col. 9, lines 14-20, Stallmo).

Regarding claim 12, Stallmo further discloses the storage devices are disks and wherein the storage layer is a RAID layer (abstract and summary, Stallmo).

Regarding claim 14, Stallmo discloses the storage system is a network-attached storage appliance (Figs.1-4 and corresponding text, Stallmo).

Regarding claim 15, Stallmo discloses that the storage devices are one of video tape, optical, DVD, magnetic tape and bubble memory devices ("306", Fig.3, Stallmo).

Regarding claim 16, Stallmo further discloses that the storage devices are media adapted to store in formation contained within the data and parity blocks (col.8, lines 45-51 and col. 9, lines 14-20, Stallmo).

Regarding claims 17 and 20, Stallmo discloses an apparatus for enabling parity declustering in a balanced parity array of a storage system, the apparatus comprising:

- means for combining a plurality of unbalanced stripe arrays to form the balanced array, each unbalanced stripe array having parity blocks on a set of storage devices that are disjoint from a set of storage devices storing data blocks (summary; col.8, lines 45-51, Stallmo discloses organizing a plurality of disks of varying sizes of data blocks "a plurality of unbalanced stripe arrays" into multiple rectangles of disks that all contain the same number of blocks "balanced array"); and
- means for distributing assignment of devices to parity groups throughout the balanced array such that all storage devices contain the same amount of data or parity information (col.7, line 66 to col.8, line 3).

Stallmo, however, does not disclose parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks. Baylor discloses double failures in multiple device system that assigned each data block to two different parity sets and these parity block each resided on a different data storage device (abstract, col.3, lines 28-45 and col.4, lines 6-28, Baylor) reads on the claimed "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Stallmo to include the claimed limitation as taught by Baylor. The motivation of doing so would have been to enhance the storage device system's availability.

Regarding claims 18 and 21, Stallmo/Baylor combination further discloses means for dividing each storage device into blocks; and means for organizing the blocks into stripes across the devices, wherein each stripe contains data and parity blocks from each of the devices of the balanced array (summary; col.8, lines 45-51, Stallmo).

Regarding claims 19 and 22, Stallmo/Baylor combination discloses the selecting patterns of characters representing data storage devices of a stripe (summary and Figs.4-5, Stallmo).

Regarding claims 55and 71, Stallmo discloses a computer implemented method for enabling parity declustering of a storage system, the method comprising the steps of:

providing a first array of storage devices for storing data blocks and parity blocks, the data blocks organized into at least one parity group associated with the parity blocks, the first array storing an unequal number of blocks on differing ones of the storage devices (summary; col.8, lines 45-51, and col.9, lines 46-53. Stallmo discloses the "first level" corresponding to "a first array");

providing a second array of storage devices for storing data blocks and parity blocks, the data blocks organized into at least one parity group associated with the parity blocks, the second array storing an unequal number of blocks on differing ones of the storage devices (summary; col.8, lines 45-51, and col.9, lines 46-53. Stallmo discloses the "second level" corresponding to "a second array");

combining the first and second arrays to form a combined array having substantially the same number of blocks stored on each storage device of the combined array (summary; col.8, lines 45-51, Stallmo discloses organizing a plurality of disks of varying sizes of data blocks "a plurality of unbalanced stripe arrays" into multiple rectangles of disks that all contain the same number of blocks "balanced array"); and

changing the association of data blocks with parity groups in the first array and the second array so that each parity group is associated with data blocks that are distributed substantially uniformly throughout the storage devices that store data blocks in the combined array (col.6, lines 25-34; col.8, lines 45-51, and col.9, lines 46-53).

Stallmo, however, does not disclose data blocks that are distributed throughout the storage devices and stored data blocks the array. Baylor discloses double failures in multiple device system that assigned each data block to two different parity sets and these parity block each resided on a different data storage device (abstract, col.3, lines 28-45 and col.4, lines 6-28, Baylor) reads on the claimed "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Stallmo to include the claimed

limitation as taught by Baylor. The motivation of doing so would have been to enhance the storage device system's availability.

Regarding claim 56, Stallmo/Baylor combination discloses organizing the data and parity blocks into stripes across the storage devices (col.8, lines 45-51, and col.9, lines 46-53, Stallmo).

Regarding claim 57, Stallmo/Baylor combination discloses wherein the step of redistributing comprises the step of changing the association of the data storage devices with parity groups from stripe to stripe in the combined array (col.6, lines 25-34; col.8, lines 45-51, and col.9, lines 46-53, Stallmo).

Regarding claim 58, Stallmo/Baylor combination discloses wherein the step of changing comprises the step of selecting differing patterns of characters representing data storage devices of a stripe (col.6, lines 25-34; col.8, lines 45-51, and col.9, lines 46-53, Stallmo).

Regarding claim 61, Stallmo discloses wherein the storage devices are disk drives (col.8, lines 45-51, and col.9, lines 46-53, Stallmo)

Regarding claims 62 and 72-73, Stallmo discloses a computer-implemented method for enabling parity declustering of a storage array having a plurality of storage devices, the method comprising the steps of:

- dividing each storage device into blocks (col.9, lines 14-20 and lines 46-53. Stallmo discloses a plurality of "squares" corresponding to "blocks").
- organizing the blocks into a plurality of stripes across the storage devices, wherein each stripe contains data and parity blocks (col.9, lines 40-45 and col.11, lines 7-10).

- storing data in data blocks and parity information in parity blocks, the parity blocks storing parity information for a plurality of parity groups (Fig.8; col. 11, lines 7-10 and lines 50-67); and
- varying the association of the storage devices to parity groups from stripe to stripe in the storage array such that each parity group is associated with data blocks that are distributed substantially uniformly throughout the storage devices that store data blocks in the storage array (col.6, lines 25-34; col.9, lines 40-45 and col.11, lines 7-10).

Stallmo, however, does not disclose data blocks that are distributed throughout the storage devices and stored data blocks the array. Baylor discloses double failures in multiple device system that assigned each data block to two different parity sets and these parity block each resided on a different data storage device (abstract, col.3, lines 28-45 and col.4, lines 6-28, Baylor) reads on the claimed "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Stallmo to include the claimed limitation as taught by Baylor. The motivation of doing so would have been to enhance the storage device system's availability.

Regarding claim 63, Stallmo/Baylor combination discloses wherein the step of changing comprises the step of selecting differing patterns of characters representing data storage devices of a stripe to thereby change the association of data blocks with parity groups from stripe to stripe of the storage array (col.6, lines 25-34; col.9, lines 40-45 and col.11, lines 7-10, Stallmo).

Regarding claims 64 and 78-79, Stallmo discloses an apparatus for enabling parity declustering of a storage system, the apparatus comprising:

- a first array of storage devices for storing data blocks and parity blocks, the data blocks organized into at least one parity group associated with the parity blocks, the first array storing an unequal number of blocks on differing ones of the storage devices (summary; col.8, lines 45-51, and col.9, lines 46-53. Stallmo discloses the "first level" corresponding to "a first array");
- a second array of storage devices for storing data blocks and parity blocks, the data blocks organized into at least one parity group associated with the parity blocks, the second array storing an unequal number of blocks on differing ones of the storage devices (summary; col.8, lines 45-51, and col.9, lines 46-53. Stallmo discloses the "second level" corresponding to "a second array");
- a storage operating system configured to combine the first and second arrays to form a combined array having substantially the same number of blocks stored on each storage device of the combined array, and configured to change the association of data blocks with parity groups in the first array and the second array so that each parity group is associated with data blocks that are distributed substantially uniformly throughout the storage devices that store data blocks in the combined array (summary; col.8, lines 45-51, Stallmo discloses organizing a plurality of disks of varying sizes of data blocks "a plurality of unbalanced stripe arrays" into multiple rectangles of disks that all contain the same number of blocks "balanced array").

Stallmo, however, does not disclose data blocks that are distributed throughout the storage devices and stored data blocks the array. Baylor discloses double failures in multiple device system that assigned each data block to two different parity sets and these parity block each resided on a different data storage device (abstract, col.3, lines 28-45 and col.4, lines 6-28, Baylor) reads on the claimed "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Stallmo to include the claimed limitation as taught by Baylor. The motivation of doing so would have been to enhance the storage device system's availability.

Regarding claim 65, Stallmo/Baylor combination discloses wherein each the blocks are organized into stripes across the storage devices (col.8, lines 5-52; col.9, lines 14-20 and lines 46-53 and col.11, lines 7-10, Stallmo).

Regarding claim 66, Stallmo/Baylor combination discloses wherein the storage devices are disk drives (col.8, lines 5-52, Stallmo).

Regarding claim 67, Stallmo/Baylor combination discloses wherein the storage devices are one of video tape, optical, DVD, magnetic tape and bubble memory devices (summary and col.8, lines 35-44, Stallmo).

Regarding claim 68, Stallmo/Baylor combination discloses wherein the system is a network-attached storage appliance (col.8, lines 5-52, Stallmo).

Regarding claim 69, Stallmo discloses an apparatus for enabling parity declustering of a storage array having a plurality of storage devices, the system comprising:

- a storage operating system configured to divide each storage device into blocks and organize the blocks into a plurality of stripes across the storage devices, wherein each stripe contains data and parity blocks and store data in data blocks and parity information in parity blocks, the parity blocks storing parity information for a plurality of parity groups (col.9, lines 14-20 and lines 46-53 and col.11, lines 7-10. Stallmo discloses a plurality of "squares" corresponding to "blocks");
- the storage operating system further configured to vary the association of the storage devices to parity groups from stripe to stripe in the storage array such that, each parity group is associated with data blocks that are distributed substantially uniformly throughout the storage devices that store data blocks in the storage array (col.6, lines 25-34; col.9, lines 40-45 and col.11, lines 7-10).

Stallmo, however, does not disclose data blocks that are distributed throughout the storage devices and stored data blocks the array. Baylor discloses double failures in multiple device system that assigned each data block to two different parity sets and these parity block each resided on a different data storage device (abstract, col.3, lines 28-45 and col.4, lines 6-28, Baylor) reads on the claimed "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Stallmo to include the claimed limitation as taught by Baylor. The motivation of doing so would have been to enhance the storage device system's availability.

Regarding claim 70, Stallmo/Baylor combination discloses wherein the storage operating system is configured to select differing patterns of characters representing data storage devices of a stripe to thereby change the association of data blocks with parity groups from stripe to stripe of the storage array (col.6, lines 25-34; col.9, lines 40-45 and col.11, lines 7-10, Stallmo).

Regarding claim 74, Stallmo/Baylor combination discloses wherein each unbalanced stripe array has fewer parity blocks per disk than data blocks per disk (col.15, lines 51-62 and col.20, lines 15-29, Stallmo).

Regarding claim 75, Stallmo/Baylor combination discloses wherein each unbalanced stripe array has fewer parity blocks per disk than data blocks per disk (col.14, lines 4-10; col.15, lines 51-62 and col.20, lines 15-29, Stallmo).

Regarding claims 76 and 77, Stallmo discloses an apparatus for parity declustering in a storage system, the apparatus comprising:

- a storage operating system configured to combine a plurality of first arrays of storage devices, each first array storing an unequal number of blocks per storage device, to form a second array, the second array storing substantially the same number of blocks on all storage devices (summary; col.8, lines 45-51, Stallmo discloses organizing a plurality of disks of varying sizes of data blocks "a plurality of unbalanced stripe arrays" into multiple rectangles of disks that all contain the same number of blocks "balanced array");
- the storage operating system further configured to redistribute the assignment storage devices to parity groups in the second array so that each storage device

will have a substantially equal number of blocks associated with each parity group (col.7, line 66 to col.8, line 3).

Stallmo, however, does not disclose data blocks that are distributed throughout the storage devices and stored data blocks the array. Baylor discloses double failures in multiple device system that assigned each data block to two different parity sets and these parity block each resided on a different data storage device (abstract, col.3, lines 28-45 and col.4, lines 6-28, Baylor) reads on the claimed "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Stallmo to include the claimed limitation as taught by Baylor. The motivation of doing so would have been to enhance the storage device system's availability.

Regarding claims 80-81, Stallmo discloses a method for enabling a balanced arrangement of a storage system, the method comprising the steps of:

creating a plurality of unbalanced stripe arrangements with each unbalanced stripe arrangement storing an unequal number of blocks per disk in an array of disks (summary; col.8, lines 35-61, Stallmo);

combining the plurality of unbalanced stripe arrangements to form the balanced arrangement, with the balanced arrangement storing substantially the same number of blocks per disk in the array of disks (col.8, lines 45-51 and col. 9, lines 14-20, Stallmo);

storing parity blocks across one or more disks in the array of disks to create one or more parity groups (col. 9, lines 54-67, Stallmo);

storing data blocks across the remaining disks of the disks in the array with the parity blocks and the data blocks stored on different disks of the array (col. 9, lines 54-67 and col.12, lines 15-30nm, Stallmo); and

assigning storage devices to different parity groups throughout the balanced arrangement (col.8, lines 45-51; col. 9, lines 14-20; col.20, lines 26-29 and lines 50-55, Stallmo).

Stallmo, however, does not disclose data blocks that are distributed throughout the storage devices and stored data blocks the array. Baylor discloses double failures in multiple device system that assigned each data block to two different parity sets and these parity block each resided on a different data storage device (abstract, col.3, lines 28-45 and col.4, lines 6-28, Baylor) reads on the claimed "parity blocks stored on a set of storage devices that are disjoint from a set of storage devices storing data blocks". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Stallmo to include the claimed limitation as taught by Baylor. The motivation of doing so would have been to enhance the storage device system's availability.

6. Claims 38, 40-41, 43-44 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burton et al. (US Pub. 2003/0074527) of record in view of Stallmo et al. (US 6,052,759) of record.

Regarding claims 38 and 40, Burton discloses a method for declustering a parity array having a plurality of storage devices, the method comprising the steps of:

- assigning a first plurality of data and parity blocks to a first parity group ([0017]; [0018]; [0019] and [0021]-[0025], Burton discloses a computer system include an adaptor to manage the plurality of storage disk drives whereas the storage

device is assigned to span and organized into strips contains parity and data); and

- assigning a second plurality of data and parity blocks to a second parity group, the first and second parity groups being independent from each other and distributed throughout the plurality of storage devices of the parity array ([0017]; [0018]; [0019]; [0021]; [0025] and Fig.2. Burton shows in Fig.2 that the parity group in span1 is different from span2, span3. Therefore, they are considered being independent from each other).

Burton, however, does not disclose combining the first parity group and the second parity group to form a balance array. Stallmo discloses organizing a plurality of disks of varying sizes of parity blocks "the first parity group and the second parity group" into multiple rectangles of disks that all contain the same number of blocks "balanced array" (summary; col.8, lines 45-51 and col.9, lines 15-67, Stallmo). Therefore, Stallmo's teaching of organizing a plurality of disks of varying size of the parity blocks to a form of the same size blocks "balanced array" reads on the claimed "combining the first parity group and the second parity group to form a balance array". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Burton to include the claimed features as taught by Stallmo. The motivation of doing so would have been to increase the system's performance, efficiency and it is cheap (col.5, lines 18-33, Stallmo).

Regarding claims 41 and 43, Burton discloses a declustered parity array, comprising:

- a plurality of storage devices having a first and second parity group (abstract; [0017]; [0018]; [0019]; [0021]-[0025], Burton);
- a first plurality of data and parity blocks assigned to the first parity group; and a second plurality of data and parity blocks assigned to the second parity group, +the first and second parity groups being independent from each other and distributed throughout the plurality of storage devices of the parity array ([0017]; [0018]; [0019]; [0021]; [0025] and Fig.2. Burton shows in Fig.2 that the parity group in span1 is different from span2, span3. Therefore, they are considered being independent from each other).
- Burton, however, does not disclose combining the first parity group and the second parity group to form a balance array. Stallmo discloses organizing a plurality of disks of varying sizes of parity blocks "the first parity group and the second parity group" into multiple rectangles of disks that all contain the same number of blocks "balanced array" (summary; col.8, lines 45-51 and col.9, lines 15-67, Stallmo). Therefore, Stallmo's teaching of organizing a plurality of disks of varying size of the parity blocks to a form of the same size blocks "balanced array" reads on the claimed "combining the first parity group and the second parity group to form a balance array". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Burton to include the claimed features as taught by Stallmo. The motivation of doing so would have been to increase the system's performance, efficiency and it is cheap (col.5, lines 18-33, Stallmo).

Regarding claims 44 and 46, Burton discloses a declustered parity array, comprising:

- a plurality of storage devices (abstract; [0017]; [0018]; [0019]; [0021]-[0025], Burton);
- means for assigning a first plurality of data and parity blocks to a first parity group ([0017]; [0018]; [0019] and [0021]-[0025], Burton discloses a computer system include an adaptor to manage the plurality of storage disk drives whereas the storage device is assigned to span and organized into strips contains parity and data); and
- means for assigning a second plurality of data and parity blocks to a second parity group, the first and second parity groups being independent from each other and distributed throughout the plurality of storage devices of the parity array ([0017]; [0018]; [0019]; [0021]-[0025] and Fig.2. Burton shows in Fig.2 that the parity group in span1 is different from span2, span3. Therefore, they are considered being independent from each other).
- Burton, however, does not disclose combining the first parity group and the second parity group to form a balance array. Stallmo discloses organizing a plurality of disks of varying sizes of parity blocks "the first parity group and the second parity group" into multiple rectangles of disks that all contain the same number of blocks "balanced array" (summary; col.8, lines 45-51 and col.9, lines 15-67, Stallmo). Therefore, Stallmo's teaching of organizing a plurality of disks of varying size of the parity blocks to a form of the same size blocks "balanced array" reads on the claimed "combining the first parity group and the second

parity group to form a balance array". It would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify Burton to include the claimed features as taught by Stallmo. The motivation of doing so would have been to increase the system's performance, efficiency and it is cheap (col.5, lines 18-33, Stallmo).

7. Claims 7, 13 and 59-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stallmo et al. (US 6,052,759) previous cited in view of Baylor et al. (US Patent no. 5,862,158) and further in view of Karr (US Patent no. 3,993,862).

Regarding claims 7 and 59-60, Stallmo and Baylor combination discloses all of the claimed limitation as discussed above, except "the characters are ternary numbers." Karr, however, discloses a system for compressing source data whereat the characters is ternary numbers (see col.4, lines 4-63, Karr). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Stallmo and Baylor including the claimed feature as taught by Karr. The motivation of doing so would have been to increase the system's performance, efficiency and it is cheap (col.5, lines 18-33, Stallmo).

Regarding claim 13, Stallmo/Baylor /Karr discloses the RAID layer is implemented in logic circuitry (see Fig.3-5 and corresponding text, Karr).

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hanh B. Thai whose telephone number is 571-272-4029. The examiner can normally be reached on 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Don Wong can be reached on 571-272-1834. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Hanh B Thai
Examiner
Art Unit 2163

December 20, 2006

ALFORD KINDRED
PRIMARY EXAMINER